भारतीय मानक
Indian Standard

IS 13913 : 2020

मालिबडेनम डाइसल्फाइड, पेस्ट — विशिष्ट

(पहला पुनरीक्षण)

Molybdenum Disulphide, Paste — Specification

(First Revision)

ICS 75.120

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भारतीय मानक ब्यूरो
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September 2020 **Price Group 3**

Lubricants and their Related Products Sectional Committee, PCD 25

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lubricants and their Related Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was initially published in 1994. Molybdenum disulphide in concentrated paste form is an important solid lubricant. It can be easily applied in paste form. It has found wide application for reducing friction and metal to metal contact under extreme pressure conditions, for example, in press fittings, power screws, running-in-lubricant for new parts and gears. It is applied where there are chances of gelling and welding.

In this first revision, clauses for references and marking have been updated. Units have been aligned with SI system. Drop point has been removed as no thickener is being used in this product.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MOLYBDENUM DISULPHIDE, PASTE — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for molybdenum disulphide, paste.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1447 (Part 3) : 1992	Methods of sampling of petroleum and its products Part 3 Method of sampling of semi-solid and solid Petroleum products (*first revision)*
1448 [P: 60] : 1994	Methods of test for petroleum and its products [P: 60] Consistency of Lubricating greases by cone penetrometer (*second revision*)
13797 : 1993	Molybdenum disulphide dispersion in oil

3 REQUIREMENTS

3.1 Composition

The product shall be a homogeneous paste containing high percentage of molybdenum disulphide powder in refined mineral lubricating base oil having a viscosity index, 80 *Min* and kinematic viscosity at 40°C as 90 - 100 mm^2/s with or without additives.

NOTE — 1 cSt = 1 mm^2/s.

3.2 The material shall also comply with the requirements given in Table 1 when tested according to the methods given in 'Part' series of IS 1448, given in col 4 of Table 1.

Table 1 Requirements of Molybdenum Disulphide, Paste

(*Clause* 3.2)

Sl No.	Characteristic	Requirement	Method of Test of IS 1448 [P:]/ Annex
(1)	(2)	(3)	(4)
i)	Consistency at 25 ± 0.5°C		[P: 60]
	a) Unworked	To report	
	b) Worked (60 double strokes)	310-340	
ii)	Molybdenum disulphide (MoS_2) content, percent by mass, *Min*	60	A
iii)	Particle size, percent by mass (less than 10 microns), *Min*	60	B

4 PACKING AND MARKING

4.1 Packing

The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

4.2 Marking

Material shall be marked with the following information:

a) Name and type of material;
b) Manufacturer's name, initials or trade-mark, if any;
c) Net mass of material;
d) Identification in code or otherwise to enable the lot of consignment or manufacture to be traced back from records and
e) Any other statutory requirements.

4.2.1 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

5 SAMPLING

Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 3).

ANNEX A

[*Table* 1, *Sl No*. (ii)]

DETERMINATION OF MOLYBDENUM DISUPHIDE CONTENT

A-L REAGENTS

A-1.1 Concentrated Nitric Acid — Specific Gravity, 1.42 A.R, Grade.

A-1.2 Perchloric Acid — 60 percent, A.R. Grade.

A-1.3 Concentrated Ammonia Solution — Specific Gravity 0.880.

A-1.4 Methyl Orange Indicator — 0.5 percent (*v*/*v*) in industrial methylated spirit.

A-1.5 Concentrated Hydrochloric Acid — Specific Gravity 1.18, A.R. Grade.

A-1.6 Ammonium Acetate Solution (Aqueous) — 30 percent (*w*/*v*).

A-1.7 Lead Acetate Solution — 2 percent (*w*/*v*) in 2 percent (*v*/*v*) acetic acid.

A-1.8 Tannic Acid Indicator — 0.1 percent (*w*/*v*) in 4 percent (*v*/*v*) acetic acid.

A-l.9 Acetic Acid, Glacial.

A-2 PROCEDURE

A-2.1 Weigh approximately 0 25 g (to the nearest of 0.001 g) (W_1) of the sample into a 400 ml beaker. Add 15 ml concentrate nitric acid and 25 ml of perchloric acid. Place on hot plate and allow to fume vigorously (do not cover the beaker). Continue heating until the sample is white and the volume of the acid is about 5 ml.

A-2.2 Cool and dilute to about 50 ml with distilled water. Add 40 ml of concentrate ammonia slowly with constant stirring and bring to boil.

A-2.3 Filter while hot through a 12.5 cm No. 41 Whatman filter paper. Collect the filtrate in a 600 ml beaker and wash the residue on filter paper at least 8 times with hot distilled water. The final volume of the filtrate should be approximately 400 ml.

A-2.4 Add 2-3 drops of methyl orange indicator and neutralise by the dropwise addition of concentrate hydrochloric acid with constant stirring.

A-2.5 Add 30 ml of ammonium acetate solution and 10 ml glacial acetic acid and bring almost to boil.

A-2.6 Add lead acetate solution slowly with constant stirring until an excess of 30 ml has been added. The bulk of the reagent should be added at a fixed rate of 30 ml in 2 min with mechanical stirring. Tannic acid solution is used as an external indicator, the endpoint being reached when a drop of filtrate added to a small volume of the tannic acid solution on a spot plate fails to develop a brown colouration.

A-2.7 Bring the solution to almost boiling condition and allow to remain at this temperature for one hour.

A-2.8 Filter the precipitate on to a 15 cm No. 42 Whatman Filter Paper and wash thoroughly with hot water.

A-2.9 Ignite the precipitate in a tared porcelain crucible at 700 - 800°C, cool and weigh (W_2).

A-2.10 Calculation

Calculate the percentage molybdenum disulphide content from the following:

$$\text{Molybdenum disulphide, percent by mass} = \frac{W2 \times 43.60}{W1}$$

where

W_1 = mass of the sample taken; and
W_2 = mass of the ignited residue.

ANNEX B

[*Table* 1, *Sl No.* (iii)]

DETERMINATION OF SIZE MOLYBDENUM DISUPHIDE PARTICLES

B-1 GENERAL

The method assesses the approximate number of molybdenum disulphide particles in size greater than 5 micron in diameter and below 5 microns.

B-2 APPARATUS

B-2.1 Optical Microscope, with a maximum magnification of at least 1500 with provision for oil immersion.

B-2.2 Balance

B-2.3 Stirrer

B-2.4 Beaker, 150 ml capacity, tall form.

B-2.5 Paraffins, medicinal quality.

B-3 PROCEDURE

B-3.1 Take 0.2 g of the material in a tall 150 ml beaker. Add 20 ml of medicinal paraffin and stir thoroughly to ensure uniform dispersion. Transfer one small drop of this diluted dispersion to a clearly microscope slide and cover with a slip ensuring even distribution of the suspension and removal of air pockets. Count the number of particles (*t*) in a total area (*a*) of the slide sufficiently large to contain at least 100 particles and consisting of at least 10 sub-areas chosen at random over the slide.

B-3.2 Count the number of particles (*g*) greater than 5 microns in diameter in an area (*b*) of the slide sufficiently large to contain at least 50 such particles at the same magnification. If less than 50 particles are counted when the area (*b*) is 100 times the area (*a*) the count may be discontinued.

B-4 CALCULATION

Particles greater than 5 microns in diameter, percent =

$$\frac{a \times g}{b \times t} \times 100$$

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Lubricants and their Related Products Sectional Committee, PCD 25

Organization	*Representative (s)*
Gulf Oil Lubricants India Ltd, Mumbai	Dr Y. P. Rao (***Chairman***)
Afton Chemicals, Mumbai	Shri Jeenal Patel
Ashok Leyland Ltd, Chennai	Shri D. Balakrishnan Shri. Ravi M. (*Alternate*)
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